CLAIMS

1. A fuel cell system comprising:

a fuel gas supply unit supplying fuel gas;

an oxidant gas supply unit supplying oxidant gas;

a fuel cell stack generating electric power using the fuel gas and the oxidant gas;

an anode off-gas recirculation unit recirculating anode off-gas, discharged from an anode of the fuel cell stack, to the anode;

a purging unit temporarily discharging the anode off-gas from the anode off-gas recirculation unit to an outside thereof;

a combustor combusting at least the anode off-gas, discharged from the purging unit, and the oxidant gas or cathode off-gas discharged from a cathode of the fuel cell stack; and

a system controller operative to perform system control such that when permitting the purging unit to discharge the anode off-gas to the combustor, a combustion temperature of the combustor does not exceed a given temperature.

2. The fuel cell system according to claim 1, wherein the system controller is operative to predict at least one of a flow rate and a composition of mixed gas, flowing into the combustor, based on an operating load of the fuel cell stack for providing a predicted result and to predict the combustion temperature of the combustor based on the predicted result such that when a predicted combustion temperature is judged to exceed the given temperature, the system control is executed so as to preclude the combustion temperature from exceeding the given temperature.

3. The fuel cell system according to claim 2, wherein the system controller is operative to perform control such that if the predicted combustion

temperature is judged to exceed the given temperature when temporarily discharging the anode off-gas from the anode off-gas recirculation unit, a flow rate of the oxidant gas to be supplied from the oxidant gas supply unit is increased for thereby increasing flow rates of the oxidant gas or the cathode off-gas to be supplied to the combustor.

4. The fuel cell system according to claim 2, further comprising an auxiliary oxidant gas supply unit supplying auxiliary oxidant gas to the combustor;

wherein the system controller is operative to perform control such that if the predicted combustion temperature is judged to exceed the given temperature when temporarily discharging the anode off-gas from the anode off-gas recirculation unit, the auxiliary oxidant gas is additionally supplied to the combustor from the auxiliary oxidant gas supply unit.

5. The fuel cell system according to claim 2, wherein the system controller is operative to perform control such that if the predicted combustion temperature is judged to exceed the given temperature when temporarily discharging the anode off-gas from the anode off-gas recirculation unit, an anode off-gas flow rate is set to be less than a predetermined discharge flow rate and an anode off-gas discharge time interval is increased.

6. The fuel cell system according to claim 2, wherein the system controller is operative to perform control such that if the predicted combustion temperature is judged to exceed the given temperature when temporarily discharging the anode off-gas from the anode off-gas recirculation unit, a cathode off-gas flow rate and an anode off-gas discharge flow rate are not altered whereas an anode off-gas discharge time interval for one cycle is set to be shorter than a predetermined discharge time interval and the anode off-gas is discontinuously discharged in the number of plural times.

7. The fuel cell system according to claim 2, wherein the system controller is operative to perform control such that if the predicted combustion temperature is judged to exceed the given temperature when temporarily discharging the anode off-gas from the anode off-gas recirculation unit, water is supplied to the combustor at a given flow rate.

8. The fuel cell system according to claim 3, wherein the system controller is operative to predict the combustion temperature through an enthalpy calculation of gases flowing into or flowing out from the combustor.

9. The fuel cell system according to claim 3, wherein the system controller is operative to preliminarily store a map of combustion temperatures in terms of a cathode off-gas discharge rate condition that is experimentally obtained in advance and to predict the combustion temperature referring to the map of the combustion temperatures.

10. The fuel cell system according to claim 1, wherein the system controller is operative to commence increasing flow rates of the oxidant gas or the cathode off-gas to be supplied to the combustor from the oxidant supply unit, prior to permitting the purging unit to commence discharging of the anode off-gas, for limiting a variation rate of the flow rates.

11. The fuel cell system according to claim 1, wherein the system controller is operative to commence decreasing flow rates of the oxidant gas or the cathode off-gas to be supplied to the combustor from the oxidant supply unit, subsequent to discharging of the anode off-gas being terminated, for limiting a variation rate of the flow rates.

12. The fuel cell system according to claim 1, wherein the system controller is operative to limit a variation rate of flow rates of the oxidant gas or the

cathode off-gas to be supplied to the combustor from the oxidant supply unit such that absolute values in variation rates of the oxidant gas, to be supplied from the oxidant gas supply unit to the combustor, or the cathode off-gas decrease as temperatures of the oxidant gas or the cathode off-gas increase.

13. The fuel cell system according to claim 1, wherein the system controller is operative to advance a timing at which flow rates of the oxidant gas, to be supplied to the combustor from the oxidant supply unit, or the cathode off-gas are commenced to be increased as temperatures of the oxidant gas or the cathode off-gas increase.

14. The fuel cell system according to claim 1, wherein the system controller is operative to limit variation rates in flow rates of the oxidant gas, to be supplied to the combustor from the oxidant supply unit, or the cathode off-gas such that an absolute value of the variation rate decreases as flow rates of the oxidant gas or the cathode off-gas increase.

15. The fuel cell system according to claim 1, wherein the system controller is operative to advance a timing at which flow rates of the oxidant gas, to be supplied to the combustor from the oxidant supply unit, or the cathode off-gas are commenced to be increased as flow rates of the oxidant gas or the cathode off-gas increase.

16. The fuel cell system according to claim 1, further comprising an oxidant gas pressure control unit controlling pressures of the oxidant gas or the cathode off-gas;

wherein the system controller is operative to control oxidant gas pressure control unit such that absolute values in variation rates of flow rates of the oxidant gas or the cathode off-gas, to be supplied to the combustor, during a decremental phase of the flow rates subsequent to an incremental phase of

the flow rates of the oxidant gas or the cathode off-gas to be supplied to the combustor are made less than absolute values in the variation rates of the flow rates of the oxidant gas or the cathode off-gas to be supplied during the incremental phase.

17. A fuel cell system comprising:

fuel gas supply means supplying fuel gas;

oxidant gas supply means supplying oxidant gas;

a fuel cell stack generating electric power using the fuel gas and the oxidant gas;

anode off-gas recirculation means recirculating anode off-gas, discharged from an anode of the fuel cell stack, to the anode;

purging means temporarily discharging the anode off-gas from the anode off-gas recirculation means to an outside thereof;

a combustor combusting at least the anode off-gas, discharged from the purging means, and the oxidant gas or cathode off-gas discharged from a cathode of the fuel cell stack; and

system control means operative to perform system control such that when permitting the purging means to discharge the anode off-gas to the combustor, a combustion temperature of the combustor does not exceed a given temperature.

18. A method of controlling a fuel cell system, comprising:

preparing a fuel gas supply unit supplying fuel gas, an oxidant gas supply unit supplying oxidant gas, a fuel cell stack generating electric power using the fuel gas and the oxidant gas, a combustor combusting at least anode off-gas, discharged from an anode off-gas, and the oxidant gas or cathode off-gas, discharged from a cathode of the fuel cell stack;

discharging anode off-gas from the anode of the fuel cell stack;

recirculating the anode off-gas, discharged from the anode of the fuel cell

stack, to the anode;

combusting at least the anode off-gas, discharged from the anode of the fuel cell stack, and the oxidant gas or cathode off-gas discharged from the cathode of the fuel cell stack; and

executing system control such that when permitting the anode off-gas to be discharged to the combustor, a combustion temperature of the combustor does not exceed a given temperature.